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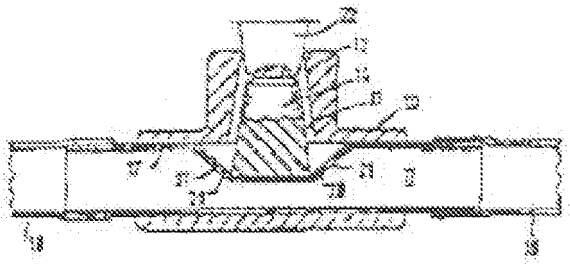
56) Citations referenced in the examination procedure according to section 44 of the patent law

DE-OS	31 32 323
DE-GM	81 04 048
EP	00 15 443

54) Injection valve for infusion devices

The injection part features a housing body (10) with a passage-channel (11) and a connecting stub (12) that opens into the passage-channel (11). The connecting stub (12) contains an essentially solid closing body (14) that fills-in the inside of the connecting stub (12). A hose 17 is located in the passage-channel (11), and is fastened to the wall of the passage-channel (11) at some distance from the position of the opening of the connecting stub (12), and acting as a support for the closing body (14) as it keeps it in the closed position. If the closing body (14) is depressed by means of the application of the outflow nipple (22) of a syringe, then the elastic area (20) of the hose (17) stretches, whereby slot (21) in this area (20) is opened.



Patent Claims

1. Injection valve for infusion devices, with a housing body that features a passage-channel, said housing body featuring a connecting stub connected to the passage-channel to introduce the outflow nipple of a syringe, and with a solid closing body that is arranged so as to be elastically depressed into the connecting stub and against the upper side of which the outflow nipple of the syringe can be placed, and the upper side of which features at least a profile with at least one sink that runs along the applied outflow nipple of the syringe, whereby as the closing body is depressed a path for a fluid is opened through the connecting stub, characterized by the fact that the wall of the passage - channel (11) features an elastic area (20) at the position of the opening of the connecting stub (12), which supports the closing body (14) and which is provided with at least one slot (21) outside of the surface that supports the closing body (14) that expands when the closing body is depressed.

2. Injection valve according to claim 1, characterized by the fact that the elastic area (20) of the wall is fastened to the housing body (10) at some distance from the point of opening.

3. Injection valve according to claim 1 or 2, characterized by the fact that the passage - channel (11) is an elastic hose (17) that is fully applied against the wall of the housing body (10).

4. Injection valve according to claim 1 or 2, characterized by the fact that the elastic area (20) is comprised of a membrane (23), the edge of which (24) is fastened to the circumferential surface (12).

5. Injection valve according to one of the claims 1 to 3, characterized by the fact that the elastic area is fastened in a ring-shape around the position of the opening of the connecting stub (12) on the wall of the housing body (10).

The invention relates to an injection valve for infusion devices, with a housing body that features a passage-channel, said housing body featuring a connecting stub connected to the passage-channel to introduce the outflow nipple of a syringe, and an elastic, depressible, solid closing body that is arranged in the connecting stub, against the upper side of which the outflow nipple of the syringe can be placed and the upper side of which features a profile with at least one sink that runs along under the applied outflow nipple of the syringe, whereby a path for a fluid is opened through the outflow nipple (sic) when the closing body is depressed.

Injection valves are required in indwelling venous cannulae and infusion lines in order to inject a liquid medication into the infusion line that leads into the patient. It is known that intermediary latex parts can be placed into infusion lines. These intermediary latex parts can be penetrated by an injection cannula, so that medication can be injected through the injection cannula into the passage channel for the infusion solution.

It is further known that an injection valve can be provided together with a venous indwelling cannula (DE GM 81 04 048). In this case the flow channel of the venous indwelling cannula is connected with a perpendicular branching hollow connecting stub that is filled with an elastic stopper. The stopper seals at the upper end of the connecting stub, respectively a flange-shaped insert fastened onto the connecting stub meets there, so that the entire volume enclosed by the connecting stub is filled with the elastic stopper and no microbial contamination can settle within the connecting stub. Such an injection valve, to be sure, requires an additional injection cannula for injection purposes, in order to penetrate through the closure body that fills the connecting stub. In this case there is a risk that material particles stamped out of the closing body by the injection cannula might make their way over the passage-channel into the body of the patient. Aside from that, the use of an additional injection cannula requires the use of extra material.

In a further known injection valve (EP-O 0 15 443) a valve body in the form of an elastic plate subject to self generated tension is arranged within the connecting stub that branches off of the passage-channel, said plate featuring a valve body suspended by radial elastic bands. The mount that circumscribes the edge, and from which the elastic bands that hold the valve body extend, is rigidly clamped between the wall of the passage -channel and a sleeve that is set into the connecting stub. On its upper side the valve body features a transverse channel against the limiting web of which the syringe cone guided from the outside is pressed in order to push the valve body away from the underside of the sleeve, so that the injectate that flows out of the end of the transverse channel flows past the underside of the sleeve into the passage-channel. In this case, the connecting stub inside the sleeve and above the plate-shaped valve body is hollow. Bacteria can collect and multiply in this hollow space. Although the hollow space can be closed off by a covering cap to avoid contamination, in practice the cap is often open. It is not possible to subsequently carry out disinfection of the hollow space, due to its narrow shape. The hollow space frequently contains residues of injected medications, so that a so-called sump can develop.

According to a disclosed recommendation (patent application P 31 32 323.5-35) that belongs to the state of the art, the hollow space of the connecting stub is filled by an elastic, despressable closing body which, in the depressed state, opens a path for fluids from the cone of the syringe to the passage-channel and following its removal from the outflow nipple, reverts to the closing position. The closing stopper is thereby supported by a solid part of the wall of the passage channel. It is either formed as a solid and supported by an elastic element on the wall, or is formed entirely elastic.

The invention has the basic task of further developing an injection valve of the type indicated in the introduction, that is, an injection valve with a depressible closing body that fills the connecting stub in such a way that it features nearly no dead space to collect bacteria and contamination, can be disinfected and produced in a simple manner.

To accomplish this task it is provided that, according to the invention, the wall of the passage-channel features an elastic area at the position of the opening of the connecting stub, which supports the closing body and is provided with at least one slot outside of the

surface that supports the closing body, said slot expanding when the closing body is depressed.

In this case the essentially solid closing body fills the hollow space of the connecting stub when the elastic wall part is in the relaxed state, whereby the connecting stub is sealed off. Upon injection, the outflow nipple of the syringe is pressed against the closing body, which then presses the elastic area into the passage-channel. The elastic area is hereby subject to tension, whereby its slot or its slots expand and open a passage into the passage-channel.

As a result of the fact that the slot is closed when the closing body is in the closed position, a dual-seal of the injection valve is achieved, that is, one time as a result of the closing body that fills the volume of the connecting piece and that is applied laterally against its wall, and the other as a result of the closed slot or the closed slots of the relaxed or non-distended elastic area.

Advantageously, the elastic area of the wall is fastened to the housing body at some distance from the positioning of the opening, so that an adequate further area of expansion is available laterally next to the floor of the closing body. The slots can be found in this expansion area. The closing body can be fastened to the elastic wall part, e.g. by adhesion. The elastic area may not extend into the fastening zone.

According to a preferred form of embodiment of the invention the passage-channel is an elastic hose that is applied fully against the housing body. In such a form of embodiment the injection valve is particularly easy to produce, since an elastic hose need only be emplaced in the housing body after the closing body has already been emplaced in the connecting stub. The hose can be fastened by means of adhesion, elastic tension rings or the like, but may not be fixed in the area around the position of the opening of the connecting stub, so that the hose material in this area can deform when the closing body is depressed. A particular advantage of this variant consists of the fact that the connecting stub can be formed as a fixed part of the housing body.

According to a second variant of the invention, the elastic area comprises a membrane, the edge of which is fastened to the circumferential surface of the connecting stub. The fastening, for example, can arise through adhesion, flanging or the like. A precondition for this type of fastening, to be sure, is that the connecting piece is finished separate of the housing body and is fastened to it thereafter.

Finally, the elastic area can also be fastened in a ring-shape on the wall of the housing at the position of the opening of the connecting stub.

In the following, with reference to the drawings, two exemplified embodiments of the invention are explained in greater detail. Shown are

Figure 1 a longitudinal section through a first exemplified embodiment of the injection valve in the resting state,

Figure 2 a longitudinal section as in Figure 1, but in the open state,

Figure 3 a top view of the injection valve according to figure 1,

Figure 4 a longitudinal section through a second form of embodiment of the injection valve in the closed state,

Figure 5 a longitudinal section according to figure 4 but in the opened state.

The injection valve of Figure 1 to 3 features a housing body 10 with a tube shaped passage-channel 11. A connecting stub (12) branches off radially from the passage-channel 11. The inner surface 13 of the hollow connecting stub 12 has the shape of a truncated cone. The closing body 14 is located in the connecting stub 12, the circumferential surface of said closing body being adapted to the inner surface 13 and fully filling the hollow space of the connecting stub 12. The upper side 15 of the closing body 14 tapers toward the top. It comprises three planar surfaces which are separated from each other by edges 16 (figure 3). The edges 16 form the peaks and the intermediate surfaces form the sinks of the profiling of the upper side 15.

The passage--channel 11 is delimited by a tube-shaped elastic hose 17 that projects on both ends of the housing body 11, and the free ends of which are respectively connected to another hose 18 or 19. The hose 17 has its outer wall applied against the inner wall of the housing body 10. It is adhered to the housing wall or fastened by other means, with the exception of that area that surrounds the positioning of the opening of the connecting stub 12. The underside of the closing body 14 is also fastened to the hose 17. In the area of this underside the hose 17 features a ring-shaped elastic area 20, where the elastic hose material is not fixed and which can expand. A number of slots 21 are formed in the hose 17 in the ring-shaped elastic area without the removal of material, said slots closing when the hose 17 is relaxed, according to figure 1. However, if the hose 17 is stretched by having the closing body 14 pushed into the passage-channel 11, then the slots 21 expand in order to permit fluid to pass.

Normally, an infusion solution flows through the hoses 18, 17 and 19 from an infusion vessel into a patient. If this injection solution is to have an injectate injected into it, the outflow nipple (syringe cone) 22 of a (not illustrated) syringe is placed against the upper side 15 of the closing body 14 and, as a result of pressure against the housing of the syringe, the closing body 14 is depressed, whereby its wall leaves the inner wall 13 of the connecting stub 12, so that a truncated cone-shaped ring channel is formed. At the same time the hose 17 is stretched in the area 20, whereby the slot 21 is expanded or opened. Since the lower edge of the outflow nipple 22 applies against the edges 16, the liquid injectate can flow out over the surfaces or sinks that lay between the edges 16 on the upper side of the closing body 14. Outflow of the injectate from the upper opening of the connecting stub 12 is prevented, in that the conical outflow nipple 22 closes-off this opening in a sealing manner.

As can be seen from fig. 1, when in the resting state the upper side 15 projects from the connecting stub 12, so that this upper side can easily be disinfected.

The exemplified embodiment of figure 4 and 5 is broadly similar to the first exemplified embodiment. In the following, therefore, only the differences between them are explained. In the second exemplified embodiment the elastic area 20 comprises a membrane 23 which is fastened to the under side of the conical closing body 4 and projects laterally beyond this underside. The edge 24 of the membrane 23 runs around the outer side of the connecting stub 12 and is fastened between this outer side and a hole in the wall of the passage-channel 11. The area between the edge 24 and the under side of the closing body 14 form the elastic area 20 of the membrane 23. The slots 21 are found in this ring-shaped area 20. As can be seen in particular in figure 5, the slots 21 lay under the wall of the connecting stub 12.

The elastic area 20, that is, the base 17 in the first exemplified embodiment or the membrane 23 in the second exemplified embodiment, comprises latex or a similar material of good resilience. The connecting stub 12 does not necessarily have to have a truncated cone-shaped inner surface 13, but rather can also be of a cylindrical shape. In this case the closing body would also be cylindrical. In order to provide a fluid passage when the closing body is depressed, grooves must be provided on the closing body or the inner side of the connecting stub 12, the passage through only being opened upon the depression of the closing body. The profiling on the upper side 15 of the closing body can feature one or more transverse channels in order to allow for an outflow of liquid that is as unimpeded as possible from the outflow nipple of the syringe that is applied against the closing body.

Hereto 2 pages of drawings

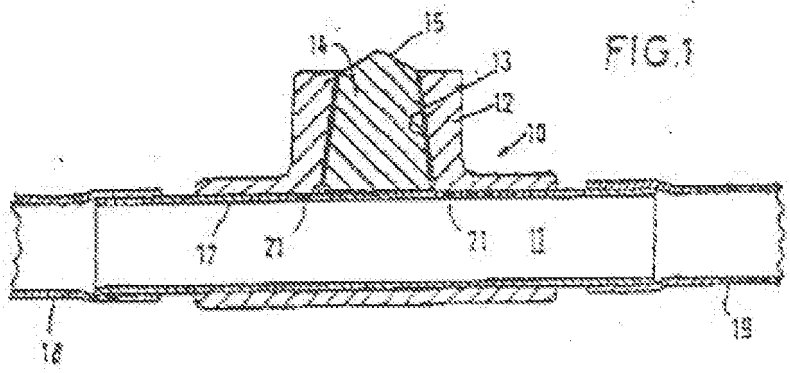


FIG.1

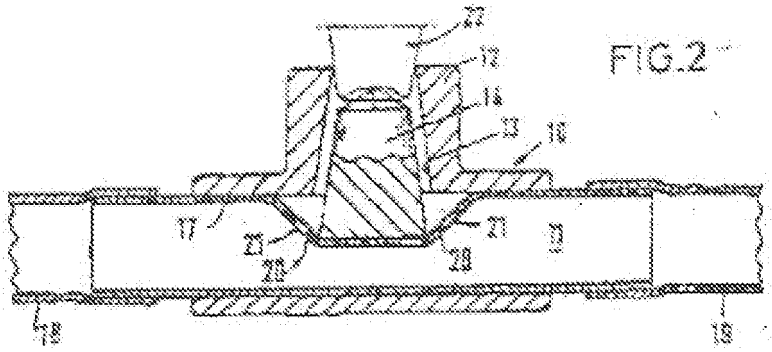


FIG.2

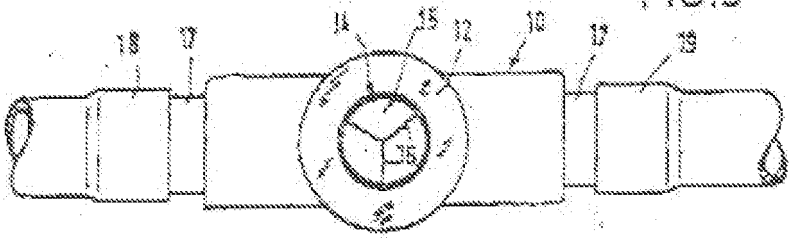


FIG.3

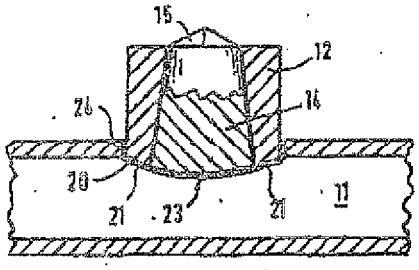


FIG.4

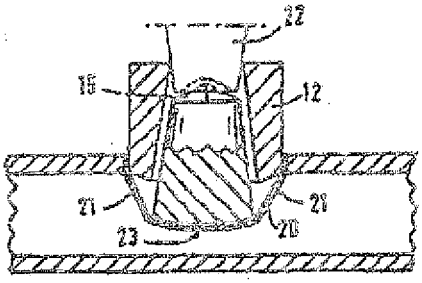


FIG.5